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USSR Report

ENERGY

No. 74

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STATUTE ON RSFSR STATE COMMITTEE FOR SUPPLY OF PETROLEUM PRODUCTS RATIFIED

Moscow SOBRANIYE POSTANOVLENIY PRAVITEL'STVA RSFSR in Russian No 4, 1980 pp 50-57

/Decree of the RSFSR Council of Ministers "On the Ratification of the Statute on the RSFSR State Committee for the Supply of Petroleum Products (RSFSR Goskomnefteprodukt)"/

/Text/ On the Ratification of the Statute on the RSFSR State Committee for the Supply of Petroleum Products (RSFSR Goskomnefteprodukt)

The RSFSR Council of Ministers resolves:

1. To ratify the proposed Statute on the RSFSR State Committee for the Supply of Petroleum Products (RSFSR Goskomnefteprodukt).

2. To recognize as invalid:

Decree No 1559 of the RSFSR Council of Ministers of 18 September 1959, "On the Formation of the Main Administration for Transport and the Supply of Petroleum and Petroleum Products Attached to the RSFSR Council of Ministers (RSFSR Glavneftesnab)" (SOBRANIYE POSTANOVLENIY PRAVITEL'STVA RSFSR, No 14, 1959, Article 119);

Decree No 1979 of the RSFSR Council of Ministers of 18 December 1959, "On the Ratification of the Statute on the Main Administration for Transport and the Supply of Petroleum and Petroleum Products Attached to the RSFSR Council of Ministers (RSFSR Glavneftesnab)" (SOBRANIYE POSTANOVLENIY PRAVITEL'STVA RSFSR, No 20, 1959, Article 173).

Chairman of the RSFSR Council of Ministers
M. Solomentsev

Administrator of the RSFSR Council of
Ministers I. Smirnov

Moscow, 6 December 1979, No 590

Ratified by Decree No 590 of the RSFSR
Council of Ministers of 6 December 1979

Statute on the RSFSR State Committee for the Supply of Petroleum Products (RSFSR Goskomnefteprodukt)

1. The RSFSR State Committee for the Supply of Petroleum Products (RSFSR Goskomnefteprodukt) is a central union republic organ of state administration of the RSFSR and in its activity is subordinate to both the RSFSR Council of Ministers and USSR Gossnab.

The RSFSR Goskomnefteprodukt bears responsibility for the implementation of the established plans of the supply of the national economy with petroleum products, the most economical organization of the delivery and receipt and the proper storage of petroleum products.

2. The main tasks of the RSFSR Goskomnefteprodukt are:

a) the supply of petroleum products according to the established list to the associations, enterprises, organizations and institutions on the territory of the RSFSR in conformity with the assets allocated to them, as well as the supply of the owners of private vehicles with fuel and lubricants;

b) the assurance of deliveries of petroleum products to other union republics and for export in accordance with the established plans;

c) the monitoring of the efficient and economical use of petroleum products by the associations, enterprises, organizations and institutions of the RSFSR;

d) the development of the material and technical base of the associations, enterprises and organizations of the RSFSR Goskomnefteprodukt; the assurance of the efficient use of productive capital, material, manpower and financial resources, the intensification of the policy of economy at subordinate associations, enterprises and organizations; the acceleration of the implementation of scientific and technical discoveries and developments in the area of the supply of petroleum products; the improvement of product quality.

3. The RSFSR Goskomnefteprodukt heads the subordinate associations, enterprises and organizations directly or through the organs set up by it in accordance with established procedure.

The RSFSR Goskomnefteprodukt, the associations, territorial administrations, administration of main petroleum product pipelines, bulk plants and general-purpose filling stations, which are subordinate to it, and other subordinate enterprises and organizations constitute the system of the RSFSR Goskomnefteprodukt.

4. The RSFSR Goskomnefteprodukt in its activity is guided by the USSR Constitution and the RSFSR Constitution, the laws of the USSR and the laws of the RSFSR, the ukases of the Presidium of the USSR Supreme Soviet and the Presidium of the RSFSR Supreme Soviet, the decrees and regulations of the USSR Government and the RSFSR Government, the decrees, regulations, orders, instructions and directives of USSR Gossnab, other enforceable enactments, as well as this Statute and ensures the

proper application of the laws in force at subordinate associations, enterprises and organizations.

The RSFSR Goskomnefteprodukt generalizes the practice of applying the legislation on questions which are within its competence, draws up suggestions on the improvement of this legislation and submits them in accordance with established procedure for the consideration of the RSFSR Council of Ministers.

5. The RSFSR Goskomnefteprodukt in conformity with the tasks assigned to it:

a) draws up drafts of the five-year and annual plans of economic and social development for the sector and submits them for approval in accordance with established procedure, drafts and approves the plans for subordinate associations, enterprises and organizations and ensures the fulfillment of these plans;

b) drafts for subordinate territorial administrations consolidated plans of the deliveries to ministries and departments of petroleum products in accordance with the list of USSR Gosplan on the basis of the established plans of distribution and the plans of interrepublic deliveries of petroleum products;

c) establishes the demand of the national economy for petroleum products in accordance with the list of USSR Gossnab and in conformity with the assets allocated by USSR Gossnab, approves for subordinate territorial administrations the plans of distribution and the plans of deliveries for these petroleum products;

d) receives petroleum products from the petroleum refining enterprises located on the territory of the RSFSR, as well as those arriving in accordance with the plans of interrepublic deliveries; carries out in accordance with the established plans the delivery of petroleum products for the national economy and for export; ensures the registration and storage of petroleum products;

e) draws up and submits for approval in accordance with established procedure drafts of the plans of the rail, motor, sea and river transportation of petroleum products, as well as their pumping through main petroleum product pipelines and ensures the fulfillment of these plans;

f) elaborates and implements measures on the improvement of the organization of deliveries of petroleum products and the forms of service at general-purpose filling stations;

g) organizes and manages the work on the efficient use of spent petroleum products, ensures the receipt at the bulk plants and filling stations of the Committee of spent lubricating oils and other petroleum products from consumers and carries out their reclaiming in accordance with the established plans;

h) coordinates the work on the introduction of the RSFSR national economy of pipeline container pneumatic transport; carries out the technical management in the designing of the technological section, the technical management of the installation and adjustment of the systems of this type of transport at the associations, enterprises and organizations of the ministries and departments of the RSFSR;

i) ensures the effective use of capital investments, the construction and timely placement into operation of main petroleum product pipelines, bulk plants, general-purpose filling stations and other facilities, drafts for them the technical and economic substantiations, the engineering (detail engineering) designs and blueprints; in conformity with established procedure examines and approves the title lists and planning estimates, makes an appraisal of the designs and estimates for the construction of these facilities;

j) carries out the production of equipment and metal structures for the bulk plant system, petroleum product pipeline transport, general-purpose filling stations and of other products for the needs of the national economy and for export, as well as of consumer goods for the needs of the national economy;

k) elaborates and implements measures on the improvement of the planning and organization of scientific research in the area of the transportation, receipt, storage, release and reduction of the losses of petroleum products, the efficient use of spent fuel and lubricants and their recovery, pipeline container pneumatic transport, automated control systems; introduces the latest achievements of science and technology, advanced know-how, means of the mechanization, automation and remote control of technological and production processes at subordinate associations, enterprises and organizations; organizes the work on rationalization, the development of inventions, the certification of product quality; supervises the work on standardization, metrology and scientific and technical information at the associations, enterprises and organizations of the Committee;

l) takes part in the review of state standards and specifications for petroleum products, the methods of their testing, as well as makes suggestions on the change of state standards and specifications;

m) implements jointly with ministries and departments measures on controlling the losses of petroleum products during their receipt, release, storage, transportation and use;

n) establishes in accordance with established procedure economic, scientific and technical contacts with foreign countries;

o) carries out the supervision of the financial and economic activity of the subordinate associations, enterprises and organizations and the monitoring of the observance by them of financial, budgetary and estimate discipline; ensures the preservation of socialist property;

p) ensures the active use of cost accounting, the profit, the production cost and other economic levers and stimuli; implements measures on the maximum utilization of internal production reserves;

q) carries out the supervision and monitoring of the organization of accounting and reporting at the associations, enterprises and organizations subordinate to the Committee; implements measures aimed at the further simplification and improvement of accounting with the extensive introduction of the latest computer hardware;

r) performs work on the selection, education, training and improvement of the skills of managers, engineering and technical personnel, workers and employees and their proper utilization; carries out the elaboration and introduction of advanced forms of wages and the norm setting of labor;

s) organizes work on the improvement of labor safety procedures, labor safety practices, production hygiene and on the observance of fire safety regulations at the subordinate associations, enterprises and organizations; carries out the supervision of departmental armed security;

t) implements the necessary measures on the efficient use of natural resources, ensures the observance by the associations, enterprises and organizations of the Committee of nature conservation legislation;

u) organizes and supervises legal work at the subordinate associations, enterprises and organizations, regularly checks the state of this work;

v) organizes in accordance with established procedure the hearing in the departmental board of arbitration of the Committee of precontractual and property disputes;

w) organizes the material and technical supply of the subordinate associations, enterprises and organizations;

x) ensures the improvement of the housing, cultural and living conditions of the workers of the associations, enterprises and organizations of the Committee;

y) jointly with trade union organs:

organizes at the associations, enterprises and organizations of the Committee socialist competition, which is aimed at the development of the creative initiative of the workers, the further increase of labor productivity, the fulfillment and exceeding of the production plans, the improvement of product quality and the decrease of the production cost; tallies the results, gives incentives to the winners of the competition in accordance with established procedure;

supervises the conclusion of collective agreements and carries out the monitoring of their fulfillment;

z) organizes the timely and attentive consideration of the suggestions, statements and complaints of citizens, seeks the correct solution of the questions raised in them, as well as takes steps on eliminating the shortcomings reported in them in the activity of the associations, enterprises and organizations of the Committee.

6. The RSFSR Goskomnefteprodukt performs the functions of the general supplier of equipment and materials for the construction of projects of petroleum product pipeline transport and the bulk plant service abroad and gives other types of technical assistance in the construction of the indicated projects.

7. The RSFSR Goskomnefteprodukt is granted the right:

a) to verify in accordance with established procedure at enterprises, organizations and institutions of the RSFSR the efficient and economical use, receipt, storage, release and transportation of petroleum products, as well as the elaboration and implementation of organizational and technical measures on these questions and to issue instructions, which are mandatory for execution, on the elimination of permitted shortcomings;

b) to enlist in the checks made by the Committee of the use, receipt, storage, release and transportation of petroleum products the specialists of associations, enterprises, organizations and institutions upon the agreement of the appropriate executives;

c) to obtain:

in accordance with established procedure from the RSFSR Central Statistical Administration the statistical data necessary for the drafting of the plans of the supply of petroleum products and the checking of the fulfillment of these plans;

from the ministries and departments of the RSFSR, the councils of ministers of the autonomous republics, the kray soviet executive committees, the oblast soviet executive committees, the Moscow and Leningrad city soviet executive committees, the associations, enterprises, organizations and institutions of the RSFSR the necessary informational materials for the checking of the use, receipt, storage, release and transportation of petroleum products.

8. The RSFSR Goskomnefteprodukt within the limits of its competence promulgates orders, instructions and issues directives on the basis of and in execution of the laws of the USSR, other decisions of the USSR Supreme Soviet and its Presidium, the laws of the RSFSR, other decisions of the RSFSR Supreme Soviet and its Presidium, the decrees and regulations of the USSR Council of Ministers and the RSFSR Council of Ministers, the decrees, regulations, orders, instructions and directives of USSR Gossnab, organizes and verifies their execution.

The RSFSR Goskomnefteprodukt in necessary instances issues joint acts with other ministries and departments.

9. The RSFSR Goskomnefteprodukt is headed by a Chairman, who is appointed in conformity with the RSFSR Constitution by the RSFSR Supreme Soviet, while during the period between sessions--by the Presidium of the RSFSR Supreme Soviet with subsequent submittal for the approval of the RSFSR Supreme Soviet.

The Chairman of the RSFSR Goskomnefteprodukt has deputies who are appointed by the RSFSR Council of Ministers.

The assignment of duties among the Deputy Chairmen is carried out by the Chairman of the RSFSR Goskomnefteprodukt.

The Chairman of the RSFSR Goskomnefteprodukt bears personal responsibility for the fulfillment by the RSFSR Goskomnefteprodukt of the tasks assigned to the Committee and for the performance by it of its functions, establishes the degree of responsibility of the Deputy Chairmen, the chiefs of the administrations, departments and other structural subdivisions of the Committee for the management of individual areas of the activity of the Committee, as well as for the work of subordinate associations, enterprises and organizations.

10. The Chairman of ths RSFSR Goskomnefteprodukt:

a) supervises the activity of the Committee;

b) approves the statutes on the administrations and departments of the Committee, as well as in accordance with established procedure the charters (statutes) on the subordinate associations, enterprises and organizations;

c) appoints and discharges the workers of the central staff of the Committee and the workers of the associations, enterprises and organizations, which are subordinate to the Committee, in conformity with the established nomenclature;

d) commissions the administrations and departments of the Committee, as well as the subordinate associations, enterprises and organizations with the solution of individual questions which are within the competence of the Committee.

11. A collegium consisting of the Chairman (the chairman of the collegium), his deputies and other executive personnel of the Committee is formed in the RSFSR Goskomnefteprodukt.

The members of the collegium are approved by the RSFSR Council of Ministers.

The collegium at its regularly held meetings examines the main questions of the activity of the Committee, questions of the practical management of the subordinate associations, enterprises and organizations, of the improvement of the organization of the supply of petroleum products, drafts of the most important orders and instructions, the checks of execution, the selection, training and placement of personnel and other questions, which belong to the competence of the RSFSR Goskomnefteprodukt.

The decisions of the collegium are implemented, as a rule, by orders of the Committee. In case of disagreements between the Chairman of the Committee and the collegium the Chairman implements his own decision, reporting the arisen disagreements to the RSFSR Council of Ministers, while the members of the collegium, in turn, can report their opinion to the RSFSR Council of Ministers.

12. A Technical and Economic Council, which is an advisory body on problems of scientific and technical progress, economics and organization in the area of the supply of the national economy with petroleum products, is set up in the RSFSR Goskomnefteprodukt.

Executive personnel and specialists of the RSFSR Goskomnefteprodukt, as well as executive personnel and specialists of ministries, departments, associations, enterprises, organizations and institutions upon the approval of the appropriate executives are members of the Technical and Economic Council.

The personal staff of the Technical and Economic Council and the Statute on it are approved by the Chairman of the RSFSR Goskomnefteprodukt.

13. The structure and number of workers of the central staff of the RSFSR Goskomnefteprodukt are approved by the RSFSR Council of Ministers with the approval of USSR Gossnab.

14. The RSFSR Goskomnefteprodukt has a seal with the imprint of the RSFSR State Emblem and with its name.

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CSO: 8144/1675

ELECTRIC POWER

ROLE OF NUCLEAR POWER IN SOVIET ENERGY POLICY

West Berlin DIW VIERTELJAHRESHEFT in German No 1, Jan-Mar 81, pp 65-74

[Article by Jochen Bethkenhagen: "The Role of Nuclear Power in USSR Energy Policy"; full text of lecture delivered in October 1980 to the Second International Congress of Soviet and Eastern European Studies in Garmisch-Partenkirchen]

[Text] Effects of International Economic Factors on USSR Energy Policy

The objectives of Soviet energy policy do not basically differ from those of other industrial countries. To guarantee the highest possible economic growth, the Soviets try to achieve a long-term secured, low-cost, and environmentally safe energy supply. In addition of course there are other objectives which result from the specific situation of the USSR as a raw material and hegemonial power.

On the basis of its raw material wealth, the Soviet Union gets considerable benefit from the price policy of the OPEC Cartel. Even considering rising extraction costs[1], the export profitability of energy raw materials has gone up considerably; they would seem to lead far ahead in the order of rank. This results in the overriding interest of the Soviet Union in exporting energy sources. But it remains to be seen at what rate the Soviet Union's own energy reserves are to be swapped against imported products. The answer to this question depends last but not least on the long-term growth objective and the assumptions as to price developments on the world energy markets. Because of the high absorption capacity of the Soviet economy, the export interest would seem to be higher than among most OPEC countries. Soviet energy shipments to Western European countries and Japan are made easier by the increased readiness of those countries to import energy sources and to extend loans. In view of the partly very difficult to predict price and quantity policy of the OPEC countries, the industrial countries are trying to achieve a stronger diversification of their energy sources. Threats resulting from increased dependence on Soviet energy shipments are today being considered to be less than during the sixties last but not least in the light of political developments (detente policy)[2].

Overall, the USSR since 1974 has considerably expanded its energy exports. Net exports almost doubled in quantitative terms (1973: 154 million tons SKE [hard coal units] 1979: 292 million SKE); in terms of value they even rose from 2.5 billion TRbl [transfer rubles] to 16.5 billion TRbl, that is to say, they increased almost seven-fold. The discrepancy in the case of petroleum is even greater. Here, export quantities (net) climbed from 104 million to 159 million tons (up

53 percent), whereas net export earnings shot up from 2.1 to 13.8 billion TRbl (up 560 percent). This means that the significance of energy sources for Soviet foreign trade definitely went up. In 1973, they only accounted for about 20 percent of all export earnings whereas in 1979 the figure was more than 40 percent.

The regional distribution of exports of energy sources is problematical. On the basis of the price formation principles prevailing in the CEMA--the settlement price is made up of the average world market price over the past 5 years--exports to the CEMA countries are less profitable than shipments to the rest of the world; in 1980, the differences compared to the world market price would seem to have been more than 50 percent (see Table 1). Overall, the savings of the CEMA countries for the period of 1976-1980, resulting from the difference between world market prices and CEMA account settlement prices, were estimated by the Soviets to be more than 5 billion TRbl[3]; that comes to about 7 percent of the remaining Soviet shipments (that is to say, excluding mineral oil) during that period of time. This value would seem to have been even greater on account of the severe price rises in 1980.

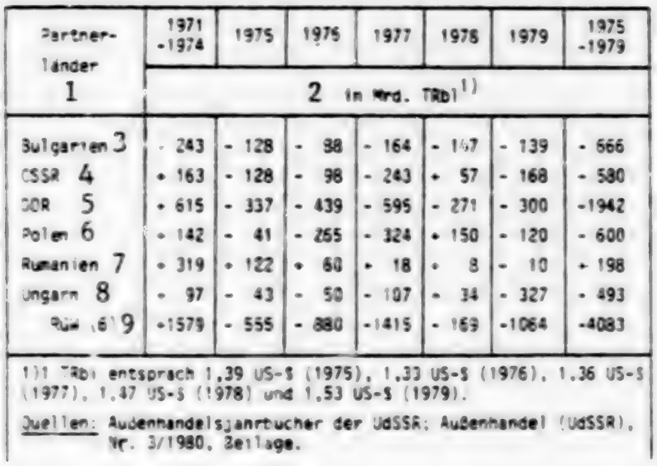
Table 1. Soviet Petroleum Prices in CEMA Intrabloc Trade, 1971-1985; Past Development and Model Computation

5 Jahr	6 Erdöl-weltmarktpreis 1)		7 RGW-Intrabloc-handelspreis	
	US-Dollar je Barrel 8	TRbl je Tonne 2) 9	TRbl je Tonne 3) 9	Veränderung 4) in vH 10
1971	2,21	14,70	13,60	- 11
1972	2,48	15,20	15,60	15
1973	3,30	18,30	16,00	3
1974	11,58	64,90	18,10	1[illegible]
1975	10,72	56,90	33,90	87
1976	11,51	63,60	37,10	9
1977	12,40	67,35	43,80	29
1978	12,70	63,75	54,20	24
1979	16,00	[illegible],25	63,30	17
1980	28,00	128,00	65,80	4
1981	32,00	146,20	80,00	22
1982	36,80	168,20	96,50	21
1983	42,30	193,30	116,70	21
1984	48,70	222,60	142,60	22
1985	56,00	255,90	171,70	20

Key: 1--Arabic light, FOB, Persian Gulf, API density [specific gravity] 34.0-34.9. This price is obviously used as reference price. Starting in 1981: 15 percent increase assumed as compared to preceding year; 2--Ton = 7.37 barrels, $1 = 0.90 TRbl (1971); 0.83 TRbl (1972); 0.75 TRbl (1973); 0.76 TRbl (1974); 0.72 TRbl (1975); 0.75 TRbl (1976); 0.74 TRbl (1977); 0.68 TRbl (1978); 0.66 TRbl (1979); 0.62 TRbl (1980); 3--1971-1976, actual price for petroleum and petroleum products computed according to data from Soviet foreign trade statistics. Starting in 1977, estimated on the basis of averages from the world market prices of the preceding 5 years. For 1975 and 1976, we obtained estimated prices for crude oil amounting to 32.80 TRbl/t and 34.00 TRbl/t; 4--Until 1976, based on actual values; 5--Year; 6--Petroleum world market price (1); 7--CEMA intrabloc trade price; 8--$ per barrel; 9--TRbl per ton (2); 10--Change in percent (4). Source: Foreign Trade Yearbooks of the USSR (Russian); GDR foreign trade.

There are narrow limitations on any adaptation of CEMA prices to world market prices because of the stressability of the national economies of the partner countries. This is why this price formation principle will be retained--although it is unfavorable for the USSR--last but least because of declining economic growth and rising indebtedness toward the USSR; the cumulative trade balance deficit of the European CEMA countries came to 4.1 billion TRbl between 1975 and 1979 (see Table 2).

Table 2. Deficit (-) or Surplus (+) of CEMA Countries in Trade with USSR



Partner-länder 1	1971 -1974	1975	1976	1977	1978	1979	1975 -1979
	2 in Mrd. TRbl[1)]						
Bulgarien 3	+ 243	- 128	- 88	- 164	- 147	- 139	- 666
CSSR 4	+ 163	- 128	- 98	- 243	+ 57	- 168	- 580
DDR 5	+ 615	- 337	- 439	- 595	- 271	- 300	-1942
Polen 6	+ 142	- 41	- 265	- 324	+ 150	- 120	- 600
Rumänien 7	+ 319	+ 122	+ 60	+ 18	+ 8	- 10	+ 198
Ungarn 8	- 97	- 43	- 50	- 107	- 34	- 327	- 493
RGW (6) 9	+1579	- 555	- 880	-1415	- 169	-1064	-4083

1) 1 TRbl entsprach 1,39 US-$ (1975), 1,33 US-$ (1976), 1,36 US-$ (1977), 1,47 US-$ (1978) und 1,53 US-$ (1979).

Quellen: Außenhandelsjahrbücher der UdSSR; Außenhandel (UdSSR), Nr. 3/1980, Beilage.

Key: 1--Partner countries; 2--In bi ons of TRbl (1); 3--Bulgaria; 4--Czechoslovakia; 5--GDR; 6--Poland; 7--Romania; 8--Hungary; 9--CEMA (6); (1) 1 TRbl corresponded to $1.39 (1975), $1.33 (1976), $1.36 (1977), $1.47 (1978), and $1.53 (1979). Sources: Foreign Trade Yearbooks of USSR; Foreign Trade Magazine (USSR), No 3,1980, supplement.

In view of the differing export profitability, there are purely economic considerations which support the idea of pushing energy exports primarily to Western countries. As a hegemonial power, the USSR of course does have a certain obligation to supply the CEMA countries, last but not least in order to continue to guarantee the supply of the bloc with energy sources in an autarchic manner (see Table 3). The Soviet Union, presumably on the basis of these considerations, distributed, for example, the absolute increase in its mineral oil exports during the current five-year plan roughly evenly over the CEMA countries and the rest of the world. Whether the USSR granted higher priority to Western exports during the 1981-1985 five-year plan period is something which remains to be seen. Of course, it did announce that its mineral oil shipments to the CEMA would remain roughly on the level on 1980[4]. But because we can expect only minor output increases, this might mean stagnation in Western exports.

Table 3. Net Exports (1) of Primary Energy Sources (2) in Percent of Domestic Consumption

Jahr 3	UdSSR 4	Osteuropa 5	zusammen 6
1965	12,2	- 5,5	7,3
1970	13,6	- 11,9	6,5
1975	14,6	- 18,5	5,7
1976	16,6	- 19,7	6,8
1977	16,9	- 21,4	6,6
1978	17,0	- 22,1	6,5
1979	18,0	.	.

1)Negatives Vorzeichen bedeutet Nettoimport.-2)Kohle, Erdöl, Erdgas, Primärstrom. UdSSR einschließlich Torf, Schiefer, Holz.

Quellen: Statistische Jahrbücher der RGW-Länder. Schätzungen des DIW.

Key: (1) Negative sign signifies net imports; (2) Coal, petroleum, natural gas, primary electric current. USSR, including peat, shale, wood; 3--Year; 4--USSR; 5--Eastern Europe; 6--Total. Sources: Statistical Yearbooks of the CEMA Countries; estimates by DIW [German Institute of Economic Research].

On the other hand, it is not expected that the USSR will become a net importer of oil, as this has been predicted on various occasions for the next 5 years. Instead, from the tremendous increase in the significance of energy raw materials for USSR foreign trade, we can derive increased interest in the maintenance or expansion of this export potential. This can be done first of all through energy savings measures; they are to require only half or one-third of the investments which are necessary to increase fuel production. Besides, the accelerated expansion of nuclear energy in the Soviet Union and in the other CEMA countries also improves the possibility for the most profitable export of energy raw materials to Western countries. This means that international economic developments over the past several years also contributed to a situation where the USSR is interested in the accelerated expansion of nuclear energy in its own country and in the other CEMA countries[5].

Nuclear Energy in Soviet Energy Policy

Current Significance and Expansion Plans

With the commissioning of the 1,000 Mw block in the Novo Voronezh Nuclear Power Plant in May 1980, the Soviet Union expanded its nuclear power plant capacities to 13,000 Mw[6]. This means that about 5 percent of the Soviet current generation capacities are made up of nuclear power plants (1975: 2.5 percent). In addition to water power (capacity share 20 percent; output share 14 percent), the second source of electric power generation, independent of fossil energy sources, that is, nuclear energy, is now beginning to assume importance. At this time, only about 75 percent of the power plants in the Soviet Union are being run with traditional fuels; of course, petroleum and natural gas still play a very considerable role with share of 29 percent and 26 percent (1975)[7].

By 1980, the capacity share of water power and nuclear power was to go up to 40 percent. But we can tell even now that this goal will have to be postponed to the next five-year plan. For nuclear power plants alone, plans called for an increase of 14,000 Mw, in other words, 20 percent of the total anticipated capacity increases. Just 4 months prior to the end of the plan itself, only about half of the planned plants were placed in operation (7,400 Mw).

The expansion plans for the eighties are likewise once again very ambitious. To be sure, no precise plan data are currently available. From individual reports we can however tell that there is an idea currently to increase the nuclear power plant capacities to 90,000-110,000 Mw by 1990[8]. This means that nuclear power plants would provide more than 20 percent of Soviet nuclear generating capacities. The savings effect in terms of conventional fuels would thus be about 200 million t SKE; that, at any rate, is one-eighth of the USSR's current energy consumption. Atomic power plants would then account for about 40 percent of the total capacity expansion; that share would be twice as high as had been planned originally for 1976-1980.

Annual Average Increase in Power Plant Capacities and National Income, USSR, 1960-1980, in Percent

Zeitraum 2	(1) Kraftwerks-kapazität 3	(2) National-einkommen 4	(1) : (2)
1965:60	11.5	6.8	1.69
1970:65	7.6	7.8	0.97
1975:70	5.5	5.7	0.96
1980:75[1]	4.1	5.1	0.80
1980:75	5.6	5.0	1.12

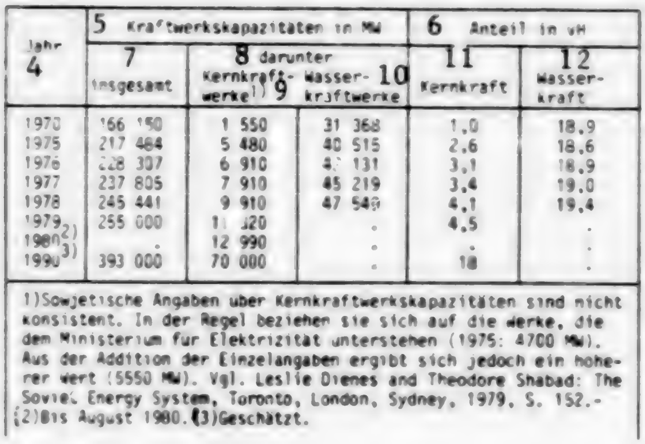
Key: 1--Plan data (five-year plan); 2--Period; 3--Power plant capacity; 4--National income.

This projection of course would seem to be based on highly optimistic assumptions regarding Soviet economic growth. It seems more realistic to start with a national income and power plant capacity growth rate of 4 percent on an annual average. Then we get a total increase of about 140,000 Mw. If we assume that nuclear power plants represent about 40 percent of the new capacities, we would get an increase of 56,000 Mw for them. Considering the already installed plants, the anticipated total nuclear power plant capacity in 1990 would be about 70,000 Mw, in other words, barely 20 percent of the anticipated power plant capacity. This predicted value likewise would seem to be, if anything, the upper limit, because the nuclear power plant share of 40 percent out of the total increase is relatively high (actual figure for 1976-1980: 15-17 percent).

This would mean that the expansion of nuclear power would of course be considerably speeded up during the eighties. As in the seventies however, we must in the future expect that the target concepts, mentioned in Soviet literature or by official or semiofficial circles, start from unrealistic, that is to say, excessively high capacity increases[9]. The USSR in this case does not differ in any way from Western countries[10]. To be sure, the reasons for the slowdown in the expansion of nuclear energy in the East and the West partly differ. The question as to the acceptance of nuclear power plants by the population plays no role in the Soviet Union. Here, technical and organizational problems are primarily responsible for the delayed completion of plants. Inadequate capacities in the sector of the supplier industries, especially machine-building and electrotechnology, in this connection would seem to play a role just as much as delays in preparatory and assembly work; corresponding complaints are at any rate being voiced in the Soviet press[11].

To be able to speed up the expansion of nuclear energy in the future, a plant (Atomash) for the series production of 1,000-Mw presurized water reactors was built in Volgodonsk. This gigantic plant, with a production shop having a ground surface of 750 x 400 m is to cost a total of 2.7 billion TRbl. The first section was completed at the end of 1978 after 6 years of construction; the first 1,000 Mw reactor is to be delivered in 1981. A capacity increase to 8,000 Mw per year is planned for the next several years. Of course, this again would seem to involve rather a remote goal because only about one-fifth of the total estimated costs for the construction of this plant has been expended as of early 1980[12].

Share of Nuclear and Hyroelectric Power Plants in Soviet Power Plant Capacities

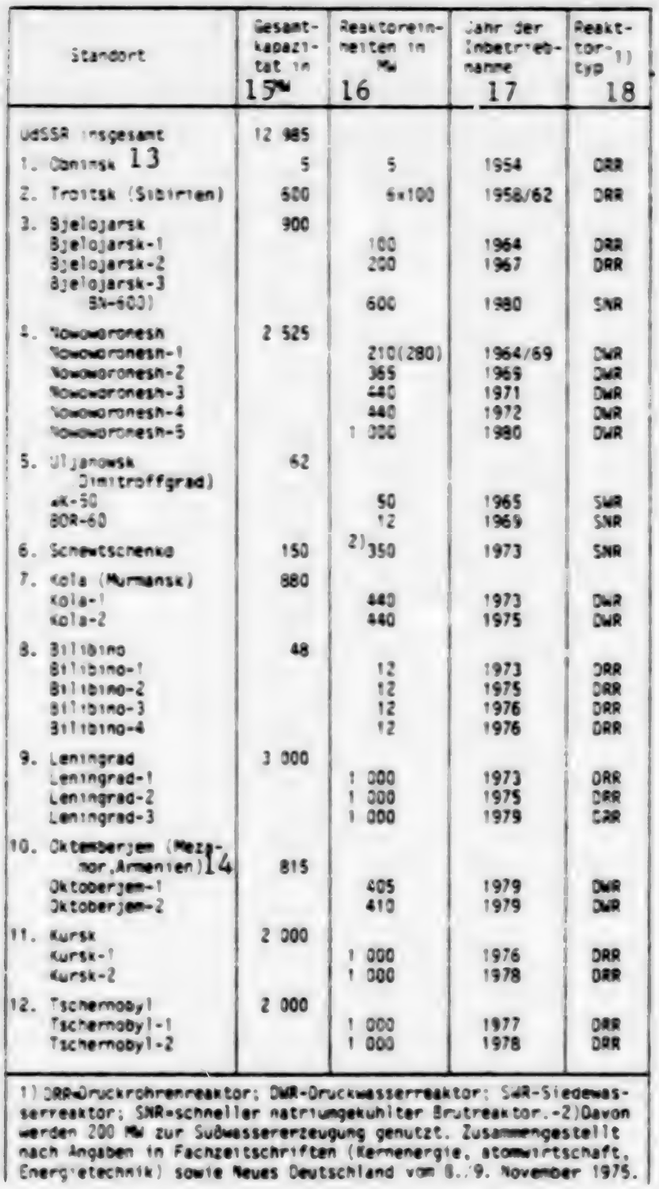


Jahr 4	5 Kraftwerkskapazitäten in MW			6 Anteil in vH	
	7 Insgesamt	8 darunter Kernkraftwerke 1) 9	Wasserkraftwerke 10	11 Kernkraft	12 Wasserkraft
1970	166 150	1 550	31 368	1,0	18.9
1975	217 484	5 480	40 515	2,6	18.6
1976	228 307	6 910	43 131	3,1	18.9
1977	237 805	7 910	45 219	3,4	19.0
1978	245 441	9 910	47 540	4,1	19.4
1979	255 000	11 420	.	4,5	.
1980 2)	.	12 990	.	.	.
1990 3)	393 000	70 000	.	18	.

1)Sowjetische Angaben über Kernkraftwerkskapazitäten sind nicht konsistent. In der Regel beziehen sie sich auf die Werke, die dem Ministerium für Elektrizität unterstehen (1975: 4700 MW). Aus der Addition der Einzelangaben ergibt sich jedoch ein höherer Wert (5550 MW). Vgl. Leslie Dienes and Theodore Shabad: The Soviet Energy System, Toronto, London, Sydney, 1979, S. 152.- (2)Bis August 1980. (3)Geschätzt.

Key: (1) Soviet data on nuclear power plant capacities are not consistent. As a rule they relate to plants which are under the Ministry of Electricity (1975: 4,700 Mw). By adding the individual data we however get a higher figure (5,550 Mw). See Leslie Dienes and Theodore Shabad, "The Soviet Energy System," Toronto, London, Sydney, 1979, p 152; (2) As of August 1980; (3) Estimated; 4--Year; 5--Power plant capacity in Mw; 6--Share in percent; 7--Total; 8--Including; 9--Nuclear power plants (1); 10--Hydroelectric power plants; 11--Nuclear power; 12--Water power. Sources: NARODNOYE KHOZYAYSTVO SSSR; The expansion of nuclear energy is to guarantee the autotarchy of the energy supply for the CEMA. Prepared by Jochen Bethkenhagen, in: WOCHENBERICHT DES DIW, No 35, 1979; ATOMWIRTSCHAFT, No 6, 1980, estimates by DIW.

Table 4. Nuclear Power Plants in Operation in the USSR (as of September 1980)



Standort	Gesamtkapazität in MW 15	Reaktoreinheiten in MW 16	Jahr der Inbetriebnahme 17	Reaktortyp 1) 18
UdSSR insgesamt	12 985			
1. Obninsk 13	5	5	1954	DRR
2. Troitsk (Sibirien)	600	6x100	1958/62	DRR
3. Bjelojarsk	900			
Bjelojarsk-1		100	1964	DRR
Bjelojarsk-2		200	1967	DRR
Bjelojarsk-3 (BN-600)		600	1980	SNR
4. Nowoworonesh	2 525			
Nowoworonesh-1		210(280)	1964/69	DWR
Nowoworonesh-2		365	1969	DWR
Nowoworonesh-3		440	1971	DWR
Nowoworonesh-4		440	1972	DWR
Nowoworonesh-5		1 000	1980	DWR
5. Uljanowsk (Dimitroffgrad)	62			
WK-50		50	1965	SWR
BOR-60		12	1969	SNR
6. Schewtschenko	150	2) 350	1973	SNR
7. Kola (Murmansk)	880			
Kola-1		440	1973	DWR
Kola-2		440	1975	DWR
8. Bilibino	48			
Bilibino-1		12	1973	DRR
Bilibino-2		12	1975	DRR
Bilibino-3		12	1976	DRR
Bilibino-4		12	1976	DRR
9. Leningrad	3 000			
Leningrad-1		1 000	1973	DRR
Leningrad-2		1 000	1975	DRR
Leningrad-3		1 000	1979	DRR
10. Oktemberjem (Mezamor, Armenien) 14	815			
Oktoberjem-1		405	1979	DWR
Oktoberjem-2		410	1979	DWR
11. Kursk	2 000			
Kursk-1		1 000	1976	DRR
Kursk-2		1 000	1978	DRR
12. Tschernobyl	2 000			
Tschernobyl-1		1 000	1977	DRR
Tschernobyl-2		1 000	1978	DRR

1) DRR=Druckrohrenreaktor; DWR=Druckwasserreaktor; SWR=Siedewasserreaktor; SNR=schneller natriumgekuhlter Brutreaktor.-2) Davon werden 200 MW zur Sußwassererzeugung genutzt. Zusammengestellt nach Angaben in Fachzeitschriften (Kernenergie, atomwirtschaft, Energietechnik) sowie Neues Deutschland vom 8./9. November 1975.

Key: (1) DRR--Pressure pipe reactor; DWR--Pressurized water reactor; SWR--Boiling water reactor; SNR--Fast sodium-cooled breeder reactor; (2) Of that amount, 200 Mw are used for sweet-water generation. Compiled according to data in technical journals (KERNENERGIE, ATOMWIRTSCHAFT, ENERGIETECHNIK) as well as NEUES DEUTSCHLAND, 8-9 November 1975; 3--Byeloyarsk; 4--Novo Voronezh; 5--Ulyanovsk; 6--Shevchenko; 10--Oktemberyem; 12--Chernoby; 13--Siberia; 14--Armenia; 15--Total capacity in Mw; 16--Reactor unit in Mw; 17--Year commissioned; 18--Reactor type (1).

Soviet energy policy is aimed at developing the sodium-cooled breeder for industrial series production as quickly as possible. To be sure, the USSR already holds a leading position in this sector[13]; but technical and organizational problems again and again cause delays in this program so that, looking at it realistically, one cannot expect the large-scale employment of this type of reactor before the end of this century. The series production of fast breeders of course is necessary if nuclear energy is to handle not just a temporarily limited stop-gap function in energy supply. It will be possible to solve the fuel supply problem in longer-range terms only with the help of this type of reactor because breeders produce more fissile material than is required for their operation[14].

At this time, the expansion program is aimed above all at two reactor types. The graphite-moderated, boiling-water-cooled pressure-pipe reactor (RBMK) is dominant here; 8,000 Mw of that type are now in operation; the pressurized-water reactor (WWER) provides only 4,200 Mw. The PWR--used for the first time in the Novo Voronezh power plant--is distinguished by its compact design (the reactor vessel can be transported by rail); apart from one exception in Czechoslovakia, it has so far been used exclusively in the other CEMA countries (currently, 3,300 Mw). So far, seven 1,000-Mw blocks are in operation regarding the pressurized-pipe reactor (Leningrad, Kursk, Chernobyl); the completion of the first 1,000-Mw PWR in Novo Voronezh has been delayed. Originally, this facility had already been planned for 1976. But this block supplied current to the grid for the first time at the end of May 1980. For the time being there are no plans for any further increase in the block output for the PWR; instead, "the consolidation of existing equipment" is to be promoted[15].

Regarding their availability figures, Soviet power plants do not significantly differ from those of the Western design. With 67 percent, the operational ability of Soviet PWR units achieves a figure which is somewhat above that of Western Europe with 65 percent and the United States with 63 percent. Of course, this result is to be further improved over the next several years; plans call for a utilization degree of 80 percent[16].

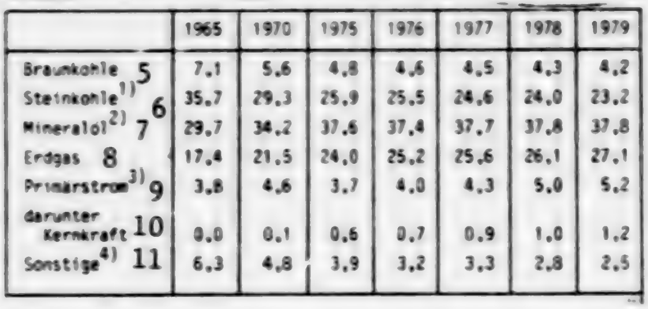
Nuclear Power Plants Designed to Increase Savings Effect

By using nuclear power plants, it is possible to save about 2 million t SKE (or 1.4 million t of oil) for every 1,000 Mw[17]. This means that the USSR would presently have a savings effect of about 1.5 percent of the consumption of conventional energy sources. By 1990, nculear power would seem to cover approximately 6-8 percent of the Soviet primary energy consumption.

To be able to replace a large share of conventional energy sources by means of nuclear energy, it will be necessary to develop additional energy-industry utilization possibilities. This introduces the aspect of heat supply. While about 25-30 percent of the primary energy consumption are being used for current generation, heat generation for industrial and private purposes accounts for 35-40 percent[18].

In 1976 already, it was agreed in the Committee on Scientific-Technical Cooperation of the CEMA to push the development of nuclear reactors with a medium and high temperature potential to supply industrial heat for technological processes in metallurgy, chemistry, agriculture, transportation, and other sectors of the national economy[19]. Just 3 years later, in August 1979, the first conference was held on a cooperation program in the field of nuclear energy utilization for long-distance heat supply in the permanent commissions of the CEMA for electric energy and for the peaceful use of atomic energy[20]. During that same year however the President of the Academy of Sciences USSR Aleksandrov declared that the first bloc of nuclear heating plants are already under construction in Gorkiy and Voronezh. By 1990, in his opinion, the construction of such heating plants will be practical in several hundred towns in the USSR because it would be possible to save about one-third of the present-day petroleum extraction volume (about 200 million t); that at any rate would be 12 percent of the anticipated energy consumption.

Table 5. USSR Primary Energy Comsumption Structure, 1965-1979, in Percent



	1965	1970	1975	1976	1977	1978	1979
Braunkohle 5	7,1	5,6	4,8	4,6	4,5	4,3	4,2
Steinkohle[1)] 6	35,7	29,3	25,9	25,5	24,6	24,0	23,2
Mineralöl[2)] 7	29,7	34,2	37,6	37,4	37,7	37,8	37,8
Erdgas 8	17,4	21,5	24,0	25,2	25,6	26,1	27,1
Primärstrom[3)] 9	3,8	4,6	3,7	4,0	4,3	5,0	5,2
darunter Kernkraft 10	0,0	0,1	0,6	0,7	0,9	1,0	1,2
Sonstige[4)] 11	6,3	4,8	3,9	3,2	3,3	2,8	2,5

Key: (1) Including coke; (2) Petroleum and petroleum products; (3) Nuclear energy, water power, and net imports; (4) Lumber, peat, and shale; 1979 estimated; 5--Brown coal; 6--Hard coal (1); 7--Mineral oil (2); 8--Natural gas; 9--Primary electricity (3); 10--Including nuclear power; 11--Miscellaneous (4). Sources: statistical yearbooks and foreign trade yearbooks of the USSR; estimates by DIW.

In addition, heat from nuclear power plants is reported to be cheaper by about one half than the heat generated in plants using organic fuels[21]. The extra expenditures for the construction of nuclear heating plants only come 5-15 percent compared to a nuclear power plant[22].

Of course, that does not include the "costs" for the closing of existing thermal power plants; they operate primarily on a basis of fuel oil and natural gas. In view of the widespread aversion in the USSR to replace existing plants after a short lifetime with more modern ones, the outlook for a crash program aimed at the expansion of nuclear thermal plants or nuclear thermoelectric power plants would seem to be poor. But closing these plants is a prerequisite for expansion because centralized heat supply in the Soviet Union already accounts for 50 percent[23].

From the viewpoint of site location, the use of nuclear thermoelectric power plants is of course problematical. For reasons of radiation protection, nuclear power plants are currently being build 50-70 km away from big cities. Lower investment costs and transportation losses however result from the selection of locations near the consumers. Such considerations point to the use of nuclear thermal plants which are to be built directly in residential sections. But that introduces considerable safety problems which among other things are to be solved through the perfection of "containment construction design" and by placing nuclear energy systems underground[24].

Fuel Cycle

Because of its military significance, information an uranium deposits, their geographic distribution, as well as the enrichment and reprocessing capacities cannot be obtained from Soviet sources. The proven and probable uranium reserves of the USSR--which can be extracted with an expenditure of up to $35 per kilogram of uranium (U_3O_8)--has been estimated at one-sixth of the world's reserves[25]. The West German Federal Institute of Earth Sciences and Raw Materials in Hanover has come up with a figure of just about 1 million t for the total supply of U_3O_8.

The quantity that can be used for energy generation of course is reduced considerably because, in thermal reactors, the utilization degree is only 1-2 percent. In natural uranium, the isotope U-235, which is needed for nuclear fission, is contained only to the extent of 0.7 percent. This is why the accelerated expansion of the fast breeder is also justified in the light of the relatively quickly exhaustible uranium reserves.

The enriched uranium, with about 3-4 percent U-235, which is needed for the operation of thermal reactors, must be made in technically complicated plants[26]. At this time, the USSR's enrichment capacity exceeds its own requirements. The USSR supplies the fuel elements not only for CEMA countries but also for the nuclear power plant delivered to Finland. Moreover, it offers uranium enrichment to Western countries in the form of job-processing deals. It was especially the energy supply enterprises in the FRG which have availed themselves of this opportunity and which in 1978 and 1979 procured about half and in 1980 40 percent of their imports of enriched uranium from the USSR. The Soviet Union might possibly be trying to use its surplus capacities through these job-processing deals; these surplus capacities resulted from the failure to stick to its ambitious expansion plans for nuclear energy in the gas diffusion plants[27]. But this means that this industry branch is also of importance in terms of foreign trade policy because the Soviet Union was at any rate possibly able to achieve about 10 percent of its foreign exchange earnings in commodity transactions with the FRG through these deals.

No information is likewise available on reprocessing capacity. The purpose of these plants is to obtain unused uranium and bred plutonium from the spent fuel elements. Plutonium, which practically does not occur in nature and which is strategically significant, is being used in the civilian sector primarily in the fast breeder[28]. At this time, it would seem that more than 2 t plutonium (about 0.22 t per 1,000 Mw) are obtained annually in the USSR; that is more than is needed for use in existing breeder reactors. In addition to the military use, a portion of the plutonium is probably stockpiled for use in fast breeders yet to be built. It is difficult to estimate to what extent the delays in development of the fast breeder--because of the fact that plutonium requirements turned out less when compared to the original plan--also lead to a slowdown in the expansion of the thermal reactors.

In the USSR, plutonium is also obtained through the return of spent fuel elements from the other CEMA countries. This on the one hand increases the quantity of Soviet plutonium material but on the other hand it guarantees effective nuclear material supply--something which is important above all in view of the problem of nonproliferation of nuclear weapons.

Safety and Environmental Problems

In contrast to the Western countries, the USSR so far has not had to deal with the question of public acceptance of nuclear power plants. The media basically advocate the idea that there is no alternative to the expansion of nuclear energy because of the exhaustibility of the reserves and that there is no reason for concern about the use of nuclear energy from the environmental and safety aspects: "If there had only been the slightest degree of danger to the population, then not a single nuclear power plant--no matter how economical it might be--would ever have been built in our country or in any other socialist country"[29]. Concerning the construction of nuclear power plants in residential areas, it was said that this could be done quite readily--"they are that reliable to operate." The public safety discussion in the West is explained in very simple terms: "The noise about the construction of nuclear power plants is due to entirely different aspects. The development of large capacities in nuclear power plants could threaten the profits of the fuel monopolies"[30].

From the public treatment of safety problems one cannot however conclude that these problems are less relevant in the USSR than in the West. Precisely because nuclear energy is always described to the public as the safest energy source, it will be necessary to avoid anything that might prove this viewpoint some day to be wrong.

So far, Soviet nuclear power plants obviously proved to be safe to operate; at any rate, nothing has become known officially so far on any accidents involving radioactive contamination[31]. Of course, Soviet safety philosophy differs from the philosophy in the Western countries. Soviet nuclear power plants as a rule are designed in a simpler fashion and are not designed for the GAU (maximum assumed accident [worst case]) as per the Western definition. Priority goes to early trouble detection while the use of more and more steel and concrete to cope with even the most improbable accident is considered economically unjustifiable. This is why Soviet power plants so far have been built without containment and emergency core cooling devices. The 1,000-Mw PWR in Novo Voronezh is the first one to be equipped with a containment. This apparently was done above all in the light of export considerations; the reactors delivered to Finland had to be provided with containment and control and regulating instruments by Western companies. The reference situation now created could in the future facilitate the export of complete plants to third countries.

Of course, in most recent times it has been possible to detect some movement in the public discussion on nuclear power plant safety. This is most pronounced in an article in the magazine KOMUNIST[32]. Here it is admitted among other things that the original forecasts regarding the expansion of nuclear energy would have to be scaled back in the Soviet Union likewise and that, contrary to earlier calculations the specific costs of nuclear power plants had gone up considerably. Difficulties arose above all in the development of the fast breeder. This reactor type would not be ready for series production early in the eighties, as had been assumed originally; instead, it will probably not be developed until the end of this century. Because the construction of breeder reactors has been delayed, the problem of fuel element reprocessing likewise is not such a serious one any longer because this process is significant primarily for plutonium procurement.

In the view of Soviet authors, nuclear power plants "considerably contribute to the restoration of health in the atmosphere"; but the fuel cycle and the removal of radioactive waste are considered the main problem in the nuclear energy industry. It is interesting to note that this is considered not only an economic and technical problem but also a sociological problem. It is furthermore admitted that, regarding the outer fuel cycle, there are no safe, reliable, and economic technologies which have been tested over a long period of time. Besides, the fuel cycle is supposed to be considerably more expensive than had been assumed originally--a lesson which the Western countries also had to learn. These critical comments, reproduced for the first time in Soviet publications, might also be interpreted as an indication for the thesis that the technical and political elites by no means consider nuclear energy to be an easy way to implement energy policy without any problems. But because peaceful and military uses of atomic energy in countries with nuclear weapons are closely intertwined, the expansion tempo can possibly be impaired by this discussion. The basic issue, as to weather nuclear energy should at all be used for energy supply, on the other hand is no longer on the agenda.

New Siting Policy?

Soviet nuclear power plants have almost exclusively been built in the densely populated European part of the country; by 1990, they are supposed to cover about one-third of the electric current requirements here. The decisive consideration in site selection was the idea of placing energy production as close as possible to the consumer centers. This was also supposed to reduce the regional disproportions between energy deposits and energy consumption. While 75 percent of the energy consumption are found in the European part of the country, only 10 percent of the energy supplies are located there.

In the USSR there is currently a discussion on the question as to whether this siting policy should also be retained in long-range terms. This appears problematical first of all for ecological reasons (cooling water requirements) and, second, for safety reasons. As the number of nuclear power plants increases, there is also an increase in the cooling water requirements and there is a greater possibility of radioactive accidents during the transportation of nuclear fuels. But this also calls for a definite increase in radiation protection expenditures.

The probably most radical proposal is aimed at a concentration of nuclear power plants in the sparsely populated regions of Siberia. Not only power plants but simultaneously also enrichment plants and reprocessing plants as well as final disposal facilities are to be concentrated in these energy centers and that supposedly would eliminate the transportation of nuclear materials which involves so many risks. In view of the unused land and water resources, the ecological problems would also be diffused in the opinion of the authors[33]. These advantages would more than compensate for the additional costs arising from energy transport.

There is no way of telling at this time to what extent these discussion contributions add up to an official site policy. In short-range terms, a correction of the current siting policy seems unlikely on account of current transmission problems. In longer-range terms, this however would seem to involve a realistic variation because high-performance electric current transmission lines (1,500 kv) are being built in the USSR even now; among other things, they are supposed to transmit electricity from the Siberian coal centers to the western part of the country.

Cooperation with other CEMA Countries and Third Countries

The USSR cooperates in the nuclear energy sector with the other CEMA countries in a series of international organizations[34]. To guarantee the bloc autarchy of energy supply also in the future, it worked out a long-term nuclear energy program with the other CEMA countries. In line with an agreement adopted at the 32nd Conference of the CEMA in 1978, 37,000 Mw in nuclear power plant capacity are to be installed in the smaller CEMA countries (including Cuba); this corresponds to a savings effect of 70-75 million t SKE (about 7 percent of the anticipated energy requirement). This means that nuclear power is to supply about 25 percent of the current consumption in those countries. While the first nuclear power plants in the CEMA countries (GDR, Bulgaria) were almost exclusively of Soviet origin, a division of labor has now been agreed upon between the member countries; a corresponding agreement on specialization and cooperation in the production of equipment for nuclear power plants was assigned during the 33rd Conference of the CEMA in 1979. Yugoslavia also participates in this program[35]. In this way, the USSR was able to shift a portion of the investment burden for the buildup of a nuclear energy industry inside the bloc to the other CEMA countries[36]. Of course, the pressure on the smaller CEMA countries, to participate in opening up Soviet raw material deposits, is now reduced; instead, they can invest their assets in the expansion of their own industry. "Interested CEMA countries however are also participating in the construction of two nuclear power plants in the USSR (Khmelnitskiy and Konstantinovka) whose capacity (4,000 Mw each) is earmarked to supply the particular CEMA countries to the extent of one half. The first plant in Khmelnitskiy is scheduled to be commissioned in 1984. By 1990, annual electric current deliveries to Poland, Hungary, and Czechoslovakia are supposed to amount to 12 billion kwh. For this purpose, the construction of a 750-kv line from Khmelnitskiy to Poland (Rzeszow) has also been agreed upon[37]. The joint nuclear energy program also means that the Soviet Union is also indirectly relieved of the burden of acting as supplier of fossil fuels and this among other things improved its possibilities of trading with the West.

Although the emphasis in the USSR's international cooperation is within the CEMA, the Soviet Union nevertheless tries also to get a foothold as exporter of nuclear power plants and nuclear fuels to third-country markets. In Finland it built two 440-Mw reactors of the Novo Voronezh type which however were improved in terms of safety by Western deliveries. The USSR in 1978 entered into an agreement with Libya for the delivery of a 300-Mw nuclear power plant. This means that a delivery agreement was concluded for the first time with a country on the fringe of the Soviet orbit[38].

Outlook

The USSR has basically favorable prerequisites for accelerated expansion of nuclear energy. It was one of the first countries in the world to start research and development work on the peaceful use of nuclear energy. As a country with nuclear weapons, it furthermore has a closed nuclear fuel cycle (enrichment and reprocessing plants); a public discussion on nuclear power plant safety does not hinder the expansion of those plants.

Of course, as a country rich in raw materials, the USSR is not compelled to use nuclear energy any time soon. Increasing difficulties and cost increases in the exploration of its own raw material deposits and the high profitability of petroleum and natural gas exports however among other things point toward the idea of their soon replacing the largest part of fossil energy sources with nuclear power. Nevertheless, nuclear energy so far with less than 5 percent accounts for a relatively small share of Soviet electric current generation (1978: EC 11 percent, U.S.A 12 percent).

The expansion of nuclear energy will be pushed in the future. By 1990 it is supposed to cover about 20 percent of the electric current needs. Besides, nuclear thermal plants are to take over a considerable portion of heat supply in industry and private households. Overall, about 10-20 percent of the anticipated primary energy requirement might be supplied through nuclear power (current and heat) by 1990. Of course, the nuclear energy industry of the Soviet Union by no means presents the picture of a dynamic industry branch without any problems. Instead, a constant loss of ground, short of the plan targets, is characteristic of the development in the Soviet Union. Like the nuclear energy industry of the Western countries, the nuclear industry of the Soviet Union was not spared setbacks. Erroneous estimates on the possibilities of solving technical problems, especially safety-engineering problems, and rising costs are just as responsible for this here as the problems inherent in the system when it comes to the completion of investment projects.

The further development of peaceful uses of nuclear energy would seem to be concentrated on the following main points:

Accelerated use of PWR with a capacity of 1,000 Mw;

Development of the fast breeder for series production, something which of course we can expect only toward the end of this century;

Development of nuclear power plants to provide processed and low-temperature heat;

Development of a closed nuclear fuel cycle for the nuclear energy industry of the CEMA countries.

The question as to whether the creation of nuclear energy centers in thinly populated areas should be pushed in long-range terms is obviously now under discussion.

The expansion of nuclear energy in the USSR will undoubtedly be speeded up in the next several years; this will mean that this form of energy will attain relative significance which at least corresponds to its significance in Western countries. But this development is significant not only for energy supply in the Soviet Union but also from foreign-trade-policy viewpoints. Within the context of the CEMA, the USSR is the most important supplier of nuclear power plants in spite of increasing division of labor. On third-country markets (Finland, Libya) the USSR has so far achieved only minor successes as supplier of nuclear power plants. Of course, it can offer complete fuel supply, including waste removal. The USSR furthermore has come to play a significant role also as supplier of enriched uranium for Western industrial countries; last but not least, the expansion of nuclear energy facilitates the export of petroleum and natural gas to Western industrial countries which is just about essential for the foreign-exchange balance.

FOOTNOTES

1. According to Soviet data, the oil extraction costs rose by 50 percent between 1965 and 1979. See V. A. Orlov, "On Some Economic Problems in the Energy Complex," FINANSY SSSR, No 8, 1978, p 19.

2. In 1979, energy imports from the USSR covered 8 percent of the FRG's energy requirements. A planned Soviet share of 30 percent out of the natural gas supply is considered justifiable by the FRG economy and government.

3. See also Oleg Bogomolov, "Collective Search for Solutions--the Fuel and Energy Problem in the CEMA Countries," PROBLEME DES FRIEDENS UND DES SOZIALISMUS, No 8, 1980, p 1090. This of course does not include the--although considerably lower--savings of the USSR resulting from the application of the CEMA account settlement price formation principle for imports from the CEMA.

4. See Oleg Bogomolow, loc. cit., p 1090.

5. "Since the middle of the seventies, efforts have been stepped up in the CEMA area to speed up nuclear energy utilization on a major-industry scale. This became necessary to spare petroleum and natural gas resources and to reserve more and more for materials uses, to counteract the rise in energy source prices, to guarantee environmental protection, to step up social production, to raise its technical level, and to improve the working and living conditions of the workers." R. Rockstroh, "On the Situation and on Some Tendencies in Major-Industry Large-Scale Employment of Nuclear Energy," KERNENERGIE, No 2, 1980, p 39.

6. See ATOMWIRTSCHAFT, No 8-9, 1980, p 396. Soviet data on nuclear power plants are not consistent. As a rule they relate to plants which are under the Ministry of Electricity (1975: 4,700 Mw). By adding up the individual figures however we get a higher value (5,500 Mw). See Leslie Dienes and Theodore Shabad, "The Soviet Energy System," Toronto, London, Sydney, 1979, p 152.

7. See ENERGETIKA SSS V. 1976-1980 GODAKH, Moscow, 1977, p 159.

8. According to Zhelodef, the Russian delegate to the IAEO, capacities are to be increased to 90,000 Mw by 1990. See also "Survey of Industry," 1 August 1980. According to the Soviet minister of energy and electrificaion, the total nuclear power plant capacity in the CEMA is to be about 150,000 Mw by 1990. See "Foreign Trade News," 3 July 1979. Because the planned capacity for the other CEMA countries is to be just about only 40,000 Mw, we would get 110,000 Mw for the USSR. According to another source, nuclear power plants in the European part of the USSR are to generate about one-third of the total electric energy volume by 1990. This figure is consistent with the 110,000-Mw target if we assume a growth rate of 6 percent per year for the entire current generating capacity and a regional distribution of 2:1 between European and non-European capacities in the USSR for 1990. See also Anatoliy Aleksandrov, "Scientific-Technological Progress and Nuclear Energy," PROBLEME DES FRIEDENS UND DES SOZIALISMUS, Prague, 1979, No 6, p 749.

9. The expansion program, approved by the 24th CPSU Party Congress in 1971, called for 30,000 Mw in nuclear power plant capacities by 1980. In the 1976-1980 five-year plan, this goal was reduced to 19,000 Mw. At this time we can at any rate expect a capacity of 12,000-14,000 Mw.

10. In 1974, a nuclear power plant capacity of 45,000 Mw was predicted for the FRG by 1985. In 1977, the assumption was only 24,000 Mw; just 3 years later, the estimate was 19,000 Mw.

11. See PRAVDA, 11 May 1978, IZVESTIYA, 10 June 1979.

12. See also NEUES DEUTSCHLAND, 19 December 1978; BERLINER ZEITUNG, 26 July 1979; NEUES DEUTSCHLAND, 8 January 1980.

13. In the view of the German atomic forum, the Soviet Union, in addition to France, has the most advanced development program in the world for fast breeder reactors with sodium cooling. See VWD, 5 June 1980.

14. In light-water reactors, the conversion rate is 0.6. This means that, for each fission, 0.6 atom of new fissile material is being bred. In fast reactors, the conversion rate is more than 1. Assuming that nuclear energy covers one-quarter of the world's primary energy consumption, the economically extractable uranium deposits would last for 30 years if we use light-water reactors and 2,500 years when breeder reactors are used. See M. Dalle-Donne, "Basic Investigations on Heat Transfer in Fast Breeder Reactors," KERNENERGIE, No 4, 1980, p 132.

15. See G. Ackermann, "Analysis of Operating Experiences in Nuclear Power Plants with PWR," KERNENERGIE, No 1, 1978, p 12.

16. Ibid., p 9. This figure was almost attained by the first block in the Leningrad nuclear power plant in 1976. See also R. Rockstroh, "On the Status and on Some Tendencies in Major-Industry Large-Scale Utilization of Nuclear Energy," KERNENERGIE, No 2, 1980, p 39.

17. Assumptions: 70 percent availability and specific fuel consumption of thermal power plants amounting to 0.33 kg SKE/kWh.

18. See A. V. Motorin, "Use of Nuclear Reactors for Heat Supply in CEMA Member Countries," ENERGIETECHNIK, No 6, 1980, p 201.

19. See R. Rockstroh, loc. cit., p 40.

20. A. V. Motorin, "Use of Nuclear Reactors for Heat Supply in CEMA Member Countries," ENERGIETECHNIK, No 6, 1980, p 202.

21. See Anatoliy Aleksandrov, "Scientific-Technical Progress and Nuclear Energy," PROBLEME DES FRIEDENS UND DES SOZIALISMUS, No 6, 1979, p 750.

22. See E. Gundermann and G. Schmidt, "Heat Supply from Nuclear Power Plants for Industrial and Community Use," KERNENERGIE, No 1, 1977, p 4.

23. See A. V. Motorin, loc. cit, p 201.

24. See E. Gundermann and G. Schmidt, loc. cit., p 3.

25. See E. Adam, "Tendencies in Energy and Safety of Nuclear Power Plants," KERNENERGIE, No 1, 1978, p 1.

26. For the initial charge of the pressurized water reactors of the Novo Voronezh type, 66 t UO_2 (4.4 percent enrichment) are needed for the 440-Mw block and of that amount one-third is transloaded each year.

27. Joachim Burghardt, "Nuclear Power Plant Engineering and Fuel Cycle," in Arnold Buchholz (editor), KERNENERGIEPOLITIK DER LAENDER DES RGW, Cologne, 1979, p 31.

28. The core fuel in the fast breeder is plutonium (PU 239); it is used in the interior fission zone in a UO_2PuO_2 mixture with a share of 20-25 percent. This inner zone is surrounded by a UO_2 "breeding cover" in which the U-238, which cannot be used in thermal reactors because it is nonfissile, is converted into Pu-239. This facilitates a utilization of the energy content of the uranium which is 60-80 times better. See Manfred Grathwohl, "Energieversorgung," Berlin, New York, 1978, p 147 F.

29. Andranik Petrosyants (chairman State Committee for Atomic Energy Utilization). Quoted in FRANKFURTER RUNDSCHAU, 4 February 1977, and Anatoliy Aleksandrov, "Prospects of the Energy Industry," NEUES DEUTSCHLAND, 21-22 April 1979.

30. Ibid.

31. The Soviet geneticist Medvedev, who lives in exile, advocates the thesis that an accident took place in 1957-1958 in a temporary atomic waste disposal facility in the Ural Mountains which reportedly contaminated an area of 100-1,000 km^2. This thesis has been confirmed in an independent analysis by American scientists. The question as to whether people were killed as a result of that accident however remains controversial. See FRANKFURTER RUNDSCHAU, 25 July 1980.

32. See N. Dolleshal and Ye. Koryakin, "The Energy Industry--Achievements and Problems," KOMUNIST, No 14, 1979, pp 19 ff.

33. N. Dolleshal and Ye. Koryakin, loc. cit., p 26 f.

34. This includes: the United Nuclear Research Center in Dubna, the Permanent Commission of the CEMA for peaceful uses of nuclear energy, as well as the International Organizations Interatominstrument and Interatomenergie.

35. See HORIZONT, No 34, 1980, p 22.

36. Czechoslovakia had to spend almost 30 percent of the investment expenditures earmarked for heavy machine-building during the period of 1976-1980 for the erection of the necessary production capacities. See AUSSENHANDEL DER TSCHECHOSLOWAKEI, No 5, 1979, p 14 f.

37. The GDR also participated in the construction of this pipeline (377 km long; completion target date 1983) because the line is also to be used within the interconnected CEMA system. See HORIZONT, No 34, 1980, p 22.

38. See NEUE ZUERCHER ZEITUNG, 5 October 1978. In a later report it was said that Libya was to get two reactors of the "Lovisa" type which the USSR had delivered to Finland. See VWD, 17 April 1980.

5058
CSO:1826/21

ELECTRIC POWER

ACADEMIC DISCUSSES GEORGIA'S ENERGY NEEDS, ATOMIC POWER

Tbilisi KOMUNISTI in Georgian 16 Jun 81 pp 2-3

[Article by GSSR Academy of Sciences Academician V. Gomelauri, chairman of the GSSR Academy of Sciences Scientific Council on Problems of Power Engineering, under rubric: "A Specialist's Opinion": "The Future of the Power System"]

[Text] The basic guidelines of economic and social development of the USSR in the 11th Five-Year Plan and for the period through 1990 focus appropriate attention on the energy development of the union republics. In Georgia particularly, according to the basic guidelines, electricity generation in the current five-year plan is to rise by 1.2 times; the Zhinvali hydrocomplex will go into operation, construction on the Khudoni GES will continue, and construction will begin on the Namokhvani GES.

It should be recalled, in this regard, that in the early 1920's Georgia had only a few small power plants in operation, generating insignificant amounts of electricity. Within the framework of the famous GOELRO [State Plan for the Electrification of Russia], efforts to solve the problem of electrical power in the republic were launched in the first days after the triumph of Soviet rule on the basis of V. I. Lenin's personal directive on the matter. Now the republic has a power system incorporating many GES's and several thermal power plants. Noteworthy among these power plants are the Tbilisi State Regional Thermal Power Plant, with a capacity of 1.26 million kw, and the Inguri GES, whose capacity in conjunction with the Vardnili GES, also built on the Inguri, comes to 1.64 million kw.

In 1970, Soviet Georgia's power plants generated about 9 billion kw hours--approximately the same amount generated in 1930 by all the power plants in the Soviet Union.

Despite these advances, in the past decade Georgia began to lag behind most of the union republics in electrical power development. By 1978, according to data from the USSR Academy of Sciences Presidium's Commission for the Study of Productive Forces and Natural Resources, average annual per capita electricity consumption was about twice as high in the Soviet Union as in Georgia. According to the same figures, average annual per capita consumption of fuel and energy resources was 7.1 tons of standard fuel in the Soviet Union and only 1.1 tons in Georgia.

The lag in electrical power engineering has resulted in a rising shortage of electricity throughout the low-water season in Georgia's rivers. Because of this, during the autumn-winter period of maximum demand it has been necessary to restrict consumers in the republic and even shut off some of them. Under such conditions, of course, it has not been possible to boost extensive electricity use in technological processes, which in turn has slowed down the rate of growth in the economy's power-worker ratio. This abnormal situation was the object of serious attention in CPSU CC Politburo Candidate Member and GCP CC First Secretary Comrade E. Shevardnadze's report at the 26th GCP Congress.

The Georgian power system's situation is due to a very definite cause. As is well known, most of the electricity consumed in a particular region is base-load electricity, consumption of which remains constant day and night and practically throughout the year. The remaining portion of the electricity that is consumed is called the variable portion of electrical load (peak or half-peak).

Because Georgia's mountainous terrain is characterized by narrow valleys it is impossible to build very large reservoirs, and after the high-water season there is a sharp drop in the amount of water carried by the republic's rivers. It is now deemed advisable, therefore, to build GES's designed basically to meet peak and half-peak loads rather than base loads. Accordingly, the yearly duration of capacity utilization will be 3200 hours in the newly operational Inguri GES, 2420 hours in the Khudoni GES now under construction, 3160 hours in the projected Namokhvani GES, and so on, yet as we know the year contains 8720 hours [sic].

The construction of these GES's is vitally important in meeting peak and half-peak demands both in the Georgian power system and the Transcaucasian Unified Power System, and also in meeting peak demands in the power systems of the southern European part of the Soviet Union. But these GES's cannot contribute substantially to the national economy's base-load electricity needs. To meet base-load demands requires power plants that can operate at full capacity day and night and all year.

Despite these characteristics of the powerful GES's already built or to be built on Georgia's rivers, in contrast to the early period the construction of new base-load capacity in Georgia has practically ceased since 1971. It is this factor which has brought about the growing shortage of electricity in Georgia's power system.

According to data from Energoset'proyekt, the electricity shortage in the Transcaucasian Unified Power System will amount to 12 billion kw hours by 1990. The Georgian power system accounts for most of the deficit, about 7.5 billion kw hours. In this calculation it is assumed that in addition to Georgia's currently operational GES's the Khudoni, Zhinvali, and Namokhvani GES's will be in operation by 1990, generating about 4 billion kw hours annually.

It must be stated that the figures from various scientific-research, project planning, and planning organizations concerning Georgia's electricity consumption level in 1990 do not jibe with one another, but if we consider the measures that have been implemented in recent years to ensure the further development of the republic's economy, as spelled out in the basic guidelines approved at the 26th CPSU Congress, and also the vital necessity of overcoming the above-mentioned lag in the power-worker ratio, we may assume that Energoset'proyekt's data can serve as the basis for discussing the republic's electrical power development in the future.

It should be pointed out that in assessing the electricity shortage Energoset'proyekt's calculations do not adequately consider one particular fundamental characteristic of the present structure of Georgia's power system. This characteristic is reflected in the fact that now--and especially by the year 1990--GES's designed to meet peak and half-peak loads will make up a large part of Georgia's power system, in contrast to most other power systems.

It is sufficient to note that the Inguri, Khudoni, and Namokhvani GES's will generate about 9 billion kw hours annually.

This problem was discussed by Comrade E. Shevardnadze in his report at the 22nd GCP CC Plenum on 11 November 1980. He said: "Although large capacities went into operation during the 10th Five-Year Plan, our electricity supply is still experiencing considerable difficulties. It is absolutely clear now that we will not be able to solve this problem until we have worked out an optimal structure of power capacity in which base-load and peak-load power plants are in balance. It is essential to work out such a structure, because the intensity of electricity supply should not be dependent on natural factors."

An analysis of actual day-and-night charts of electricity consumption in Georgia shows that at present the base-load portion of electrical demand accounts for about 65 percent of all power consumed, while the variable (peak and half-peak) portion accounts for the remaining 35 percent.

In 1990, the Khudoni, Zhinvali, and Namokhvani GES's will be in operation along with the already operational Inguri and other GES's, and the republic's annual GES output will stand at almost 12 billion kw hours. Clearly, this amount of electricity will meet all the variable portion of the Georgian power system's demand schedule. In addition, Georgia's GES's will take part in meeting peak-load demands in neighboring power systems. In addition to present power lines now connecting the power systems, therefore, construction is underway on a new 500,000-volt power line which will cross the main Caucasus Range at Nakhari Pass.

Because peak demand periods are short, meeting them will not involve the transmission of large amounts of electricity, but receiving 2 or 3 billion kw hours of peak power from the Georgian system will considerably facilitate the normal supply of electricity in neighboring power systems. In addition, GES's will also make a definite contribution to meeting the Georgian power system's base-load demands, although this contribution is unlikely to exceed 1 or 2 billion kw hours annually.

Consequently, the present program of GES construction will not only meet all the variable portion of the Georgian power system's demand schedule but also provide for the republic's GES's to take part in meeting the peak demands of neighboring power systems.

With regard to generating base-load electricity in Georgia's power system, the picture is quite different. At present, the Georgian power system has two main thermal power plants in operation. They are the Tbilisi State Regional Power Plant, with a capacity, as has been mentioned, of 1.26 million kw, and the Tkvarcheli State Regional Power Plant, which will soon have a capacity of 210,000 kw. It should be pointed out that the Tbilisi plant's originally installed steam boilers and steam turbines have already operated for more than 100,000 hours, and it cannot be said with certaintly that these facilities will be able to operate uninterruptedly until 1990.

If we consider, nevertheless, that the Tbilisi State Regional Power Plant's capacity can be used for 6000 hours annually and the Tkvarcheli plant's capacity can be used for 7000 hours, it turns out that these power plants will generate 9 billion kw hours of base-load electricity in 1990. Consequently, the Georgian power system's plants--including the base-load electricity generated by the GES's--will in 1990 be able at best to generate 10 or 11 billion kw hours of base-load electricity instead of the necessary 20 billion.

Clearly, by the end of the 12th Five-Year Plan the 9- to 10-billion-kw-hour base-load electricity deficit in Georgia's power system will undoubtedly result in a very difficult situation for the supply of electricity to the republic's economy and population, especially considering that most of the shortage will coincide with the autumn-winter maximum period.

It might be thought that in return for the 2 or 3 billion kw hours of peak-load electricity fed into the neighboring power systems Georgia's power system will receive an equivalent amount of base-load electricity from those systems in the autumn-winter period. Undoubtedly this is assumed in Elektroset'proyekt's calculations, according to which the electricity deficit in Georgia's power system in 1990 will be 7.5 billion kw hours instead of 9 to 10 billion, as mentioned above.

But because base-load and peak-load electricity are not actually equivalent, in our opinion, this assumption is not a realistic one. As we know, there is generally no surplus of base-load electricity in the European part of the Soviet Union, and if such a surplus does come about in some region, in a relatively short time it is assimilated locally by rapidly developing sectors of the economy.

Because of the length of the period in question, the complexity of relations among the power systems, possible changes in the rate of development of the economy in individual regions of the country, and other factors, these figures, of course, cannot be considered entirely accurate. But they indicate that a complete cessation of base-load capacity construction between 1970 and 1990--20 years--will certainly result in a very undesirable situation for Georgia's power system.

This is basically what Comrade E. Shevardnadze was referring to at the 26th CPSU Congress when he said:

"But life itself gives rise to new problems, the necessity of overcoming a number of disproportions in the economy in which, it must be admitted, gross errors were committed in the past. Correcting these errors will take years, but the lost billions in goods can never be recovered. I am aware that it is better to study accomplishments rather than mistakes, but mistakes can be instructive too.

"Here are a number of these problems:

"First. Development of the power complex is not keeping pace with the rate of economic development. We cannot afford not to build a base-load power plant. This was also discussed by G. A. Aliyev, and the urgency of the problem is not diminished just because its solution is slow in coming."

Studies made by Georgia's power engineers concerning the matter of building a base-load power plant make it clear that the only realistic way to overcome the difficulties involved in electrical power is to build a nuclear power plant in the republic.

It should be pointed out that in connection with the scarcity of power fuel in the European part of the Soviet Union, in particular the Transcaucasus, our power engineers have for some time now taken account of the necessity of integrated utilization of the CES's and a nuclear power plant as a source of base-load electricity in Georgia's power system. This is why they took direct part in building the nuclear research reactor in the republic and organizing its operation. This consideration was later fully confirmed by the intensive construction of nuclear plants in the European part of the Soviet Union and in countries of Western Europe.

Not until the 10th Five-Year Plan was serious attention paid to the necessity of building a nuclear power plant in Georgia.

As is well known, by decree of the 26th CPSU Congress the USSR Council of Ministers is to draft a state plan for the economic and social development of the USSR for 1981-85 and for the period through 1990 in accordance with the basic guidelines, and to submit it to the USSR Supreme Soviet for discussion in October 1981.

Although the construction of a nuclear plant involves very large capital investments and requires the allocation of unique equipment and gear, Georgia's power engineers believe that it is advisable to stipulate the beginning of construction of Georgia's nuclear power plant in the 11th Five-Year Plan.

In addition to mapping out rational ways of generating electricity, of course, it is also essential to focus attention on the matter of conserving fuel and energy resources. In this connection, there has been a surge of interest in recent years throughout the world--and, in particular, the Soviet Union--in what are known as heat pumps, which make it possible to utilize sources of low-temperature heat for the heating of buildings and a number of technological processes. It is worth noting that heat pumps also make it possible to air-condition buildings, and their operation does not result in environmental pollution from the products of fuel combustion.

According to data from the heat pump committee of the International Energy Organization, by the year 2000 heat pumps will have a significant impact on the structure of the world energy balance.

In the Soviet Union, prospects for heat pump systems were the object of attention as long ago as the early 1950's. At that time, the Georgian Academy of Sciences worked out energy-economic substantiation for the development of a central heat pump plant at Tskhaltubo Resort. The plan called for recovering the heat contained in the treatment water used in the bathhouses for heating the resort's sanatoria and other therapy buildings. This water has a year-round temperature of 30 degrees C. In the summer, the pump was used to air-condition the buildings. It also confirmed the energy-economic effectiveness of the heat pumps in utilizing the heat accumulated in the warm, humid air emitted into the atmosphere by tea factories for the thermal treatment of the green tea leaves. Tea factories would no longer need to burn scarce liquid fuel.

The development of heat pump research in Georgia derived from the fact that the operation of such installations is especially effective in regions that are not characterized by very cold winters, in accordance with laws governing processes of conversion of heat energy. Heat pumps are also effective in low-temperature technological processes, including those which take place in tea factories. And the tea industry, as we know, plays a vital role in Georgia's economy.

Through the years, a considerable amount of heat pump research has been carried out in Georgia, and laboratory and industrial-scale experimental installations have been set up. Studies have shown that piston-driven refrigeration compressors can be used to set up heat pumps--compressors which are series-produced by our nation's industry. It has also been demonstrated that for operation in heat pumps such compressors can use freon-12 and freon-148 as the working agent, fluids which are produced by Soviet chemical plants.

Since 1975, the republic's leading project-planning organizations Gruzgorstroyproyekt and Pishchepromproyekt have undertaken to draw up technical and working plans for heat pump installations.

These project-planning organizations have formed groups of engineers specializing in the design of heat pump installations. Gruzgorstroyproyekt is designing heat pump-driven heating systems which will utilize the warmth of the sea water at resorts located along the Black Sea coast to heat sanatorium buildings, to supply hot water, and to heat the swimming pools attached to the sanatoria. In order to eliminate pollution of the atmosphere by products resulting from the combustion of organic fuels, these resorts are now making extensive use of electricity, the consumption of which will be reduced by about three times when heat pumps are used.

Gruzpishchepromproyekt has drawn up a working design to equip the Samtredia Tea Factory with heat pumps. The plan also calls for the construction of a green leaf cold storage chamber next to the plant. During times when large quantities of green tea leaves are received from the plantations, storing the leaves in the chamber will make it possible to boost the factory's yearly productivity by almost 30 percent and completely eliminate product quality deterioration due to leaf processing delays. Because the tea factories' working season coincides with the period during which Georgia's GES's generate a seasonal surplus of electricity, the operation of heat pumps will yield a significant energy-economic effect, because instead of very scarce and costly liquid fuel, the tea factories can make use of relatively small quantities of cheap seasonal electricity generated by the GES's.

On the basis of proposals by GSSR Gosplan and the GSSR Academy of Sciences, the GSSR Council of Ministers has issued special orders which call for building several relatively large communal heat pump installations in Black Sea coastal resorts and in Tskhaltubo. The same orders also stipulate that heat pump installations are to go into operation in the Samtredia Tea Factory. Design and preparation work on these installations is already underway.

Calculations show that the widespread adoption of heat pump installations in the republic's coastal resorts can enable us to conserve 600,000 tons of standard fuel annually, and if all of Georgia's tea factories are outfitted with heat pump installations we can conserve almost 100,000 tons of liquid fuel per year. The use of heat pumps in several other areas of the republic and many sectors of our economy will help us conserve large quantities of organic fuel.

It should be emphasized, in conclusion, that both conserving energy resources through the development of heat pump installations and making integrated use of other types of major power plants in Georgia's power engineering are in full accordance with the decisions of the 26th CPSU Congress concerning energy development in the European part of the Soviet Union.

6854
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ELECTRIC POWER

PROGRESS AND PROBLEMS AT EKIBASTUZ GRES-1 SITE EXPLAINED

Moscow PRAVDA in Russian 24 Jul 81 p 1

[Article by Yu. Razgulyayev: "Starting-Up Soon!"]

> [Text] Construction of the first phase of the Ekibastuz GRES-1 has entered the concluding stage. The station's first three power-generating units are in stable operation and have been brought up to their rated output. Practically everything is ready at the fourth power unit as well, a generating set with a 500,000-kW capacity. Working at an accelerated rate, specialists from the Ekibastuz section of the Sibenergomontazh trust have assembled the unit in only five months--much quicker than the previous ones.

"The method of consolidated unit assembly has significantly hastened the installation of the units," said team leader F. Gubin, explaining the collective's success. "We carry out the preparation of multi-ton modules in special areas and only then do we deliver them to their specific design location. In comparison with the first generating set, the pace of the work has doubled. Additionally, the quality of the work has become considerably better."

Of course, not only this progressive method has helped to accelerate the course of the work. A strong and friendly collective of highly qualified specialists has already been formed in Ekibastuz. Many times the banner of labor glory has been raised in honor of the work teams of A. Stepanov and B. Aralbayev from the Sredazenergomontazh trust and the team of Kh. Minkhanov from the Sibenergomontazh trust. The majority of work teams from the general-contracting trust of Ekibastuzenergostroy are also successfully carrying out their socialist obligations.

It was a happy day at the construction site when the high-altitude concrete workers raised the red flag over the station's second smokestack. Its height is 330 m. The dimensions alone, however, do not make this structure unique. Here, for the first time in our country, we have done away with the refractory-brick lining which requires a great expenditure of manual labor. A polymer concrete now serves as the protective refractory. This innovation alone has reduced the cost of the stack by almost a million rubles. Next in line for the high-altitude workers are the stacks for the second GRES. Each of these must be raised to a height of more than 400 m.

All of these facts point out that the installation workers at this key construction site of the five-year plan have set a good pace. And what of the other participants? PRAVDA has already written about the slow construction of the dining facility at the GRES-2 site. We have to state that the situation there has not changed much. The construction of living quarters and cultural and domestic services facilities lags behind the production construction.

"In order to finally break this basically incorrect tendency," said the first secretary of the Ekibastuz party gorkom, G. Nikiforov, "we decided not to put the fourth unit into operation until the builders turned over everything that belongs in the complex and which insures normal working and living conditions for the power-plant engineers and builders."

The fundamental position of the city party organization exerts a noticeable influence on the course of construction. Work proceeds apace on the civil and domestic services building at the GRES and on many auxiliary shops. Work teams have been consolidated to take up the construction of kindergartens and living quarters. For the time being, however, the disruption has not been eliminated totally. Specific measures need to be taken in order to correct the situation.

The first phase of the Ekibastuz GRES-1 is only one of the steps, a beginning for the mighty cascade of power stations which will be the basis of a large-scale fuel and power complex. Therefore it is important that, from the very first steps in its construction, we concern ourselves with making life and work good for its future workers.

9512
CSO: 1822/214

DESIGN OF MIRROR-ARRAY SOLAR ELECTRIC POWER STATION DESCRIBED

Riga SOVETSKAYA LATVIYA in Russian 5 Jul 81 p 4

[Article by I. Kovalenko: "Taming the Sun"]

> [Text] A model of the country's first solar electric power station (SES) is being demonstrated at the Power Engineering pavilion of the USSR VDNKh [Exhibit of the Achievements of the National Economy]. Its construction was begun near the settlement of Lenino on the Crimean shore of the Sea of Azov. The station's design was developed by specialists from the Riga branch of the All-Union Teploelektroproyekt Institute (the general designer) and 13 other organizations. The scientific direction over the work is being carried out by the Power Engineering Institute imeni G. M. Krzhizhanovskiy of the USSR Academy of Sciences.

The output of this pioneer of solar power engineering is 5,000 kW. This is not at all small for a start. Its construction was entrusted to the collective of the Zaporozh'e Dneprostroy construction administration.

The basis of the SES-5 is composed of a broad (500-meter diameter) field of heliostats--mirror reflectors of solar rays, positioned in several rows around an 89-meter tower with a unique solar boiler-steam generator on top. According to commands from a computer, the heliostats will rotate to follow the sun in such a way that the beams reflected from the mirrors will be continuously concentrated on the surface of the steam generator. The water, heated by the daytime star to 250-300°, will form steam which will rush under pressure through pipes into the machine room, to the turbogenerators. Simultaneously, a portion of the steam-water mixture will accumulate in special reservoirs for operating turbines during the night and during rainy hours.

The SES-5 under construction is experimental in nature. It will make it possible to check theoretical calculations and to develop a technique for erecting similar structures. This experience will prove useful in the creation of more powerful SES's. Their construction is not so far off.

The Crimean is perhaps the best suited test range for experiments on the intensive utilization of solar power," said V. S. Muravskiy, chief engineer of the Riga branch of Teploelektroproyekt. "As a rule, there are more than 2,000 hours of sunlight annually on this peninsula."

The cost of a kilowatthour of electricity from the experimental station will of course be high. Because of its economy, however, the SES-300 can be competitive with modern thermal and atomic stations. It has been estimated that each kilowatt of rated output from the solar power station will annually conserve a ton of conventional fuel. It will not have to be extracted, transported somewhere and burned. It will not be necessary to create new equipment for all this. Solar power gives off no wastes.

Considering these and other factors (and, in particular, the limited reserves of natural fuel), the 26th CPSU Congress set a task to increase "the scale of utilization of renewable energy resources in the national economy," including solar energy.

9512
CSO: 1822/214

ELECTRIC POWER

KHARANORSKAYA GRES CONSTRUCTION CONTINUES

Moscow PRAVDA in Russian 21 Jul 81 p 1

[Article by V. Orlov: "They Named It Yasnogorsk"]

> [Text] From the top of a steep hill, the scenic flood-lands of the river Onon and the white buildings of the young city spread out broadly.
>
> Yasnogorsk is rising up confidently, beautifully, endlessly. It will become a mighty power base: as was decided at the 26th congress of our party, the first generating sets of the Kharanorskaya GRES must be commissioned here during the current five-year plan.

The station is designed to utilize the coal of the Kharanorskiy open pit. The station's output is 1.26 million kW. The first of six generating units is slated for introduction in 1984. The task is not simple. A reliable construction base remains to be established, and matters are further complicated by the protracted winters with temperatures of -50° C.

However, despite these difficulties, much has already been done. The creators of Yasnogorsk are trying to take into consideration both the experience and the mistakes of the builders of the Gusinoozerskaya GRES which previously had begun construction in the vicinity of Buryatiya. Here they had undertaken the industrial construction but had not thought about living quarters. This negligence resulted in an acute shortage of personnel.

This Kharanorskaya station, on the other hand, is starting out with the construction of all conveniences for the people. There is not a single temporary structure in Yasnogorsk--everything has been designed for the long-range. There are broad streets, comfortable and well-lit buildings and many new homes. The doors are just about ready to open on the integrated child-care center, dining facility, clinic and store. The erection of a 1,200-seat school with a swimming pool is in full progress. The walls of a communications center are going up as well as those of a domestic services center. The mains services have already been laid and the sewage facilities prepared.

The following have distinguished themselves at the construction sites: section chief Vladimir Osipov; Aleksandr Burdinskiy and Viktor Yaltonskiy, team chiefs of joint teams; brick layer Nikolay Spitsyn; plasterer-painter Tat'yana Derevtsova; and crane-operator Kirill Bakushev. They came here from different corners of the country. These first-termers work with enthusiasm. Nonetheless, the present pace of housing construction must be increased. In fact, about 4,000 builders and installers will come to Yasnogorsk in 1983.

When construction began on the GRES, great hopes were pinned on the Chitinskiy structural-element plant of the USSR Ministry of Power Electrification. On the basis of this plant, plans were made to create a home-building panel-construction shop which should have manufactured annually about 10 ninety-room homes, two child-care centers and a school. Work here, however, is proceeding slowly, and no one tries to say exactly when the power engineers will receive real confirmation from their own construction industry.

This is not the first year that the oblispolkom has passed resolutions regarding the apportionment of the necessary amount of bricks from local plants for the GRES under construction. These resolutions, however, remain on paper.

There are also grievances against the Zabaykaltransstroy trust, charged with the responsibility for expanding the station facilities. Last year's plan for the construction of the GRES's rail lines was disrupted, yet the trust is in no hurry to make up for this oversight in the current year.

Not everything is all right from the point of view of environmental protection. The natural surroundings of Zabaykal'ye are very vulnerable and must be treated with particular care. The designers have planned to construct an ash dump on the flood-lands of the river Onon--in that region which can become a recreation area for the inhabitants of the future city. In fact, according to the experts' calculations, these wastes can be channeled into one of the natural canyons located nearby.

Great and bright hopes in Zabaykal'ye are associated with Yasnogorsk. Indeed, the economic development of this zone gravitating toward the BAM depends in many ways upon the power of the Kharanorskaya GRES.

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BRIEFS

EXPERIMENTAL ELECTRIC-POWER LINE--Leningrad--A fiery zig-zag of artificial lightning cut across the blue sky over the test range of the Polytechnical Institute imeni M. I. Kalinin. Researchers from the VUZ began today testing an experimental span of a 3,000-kV super electric-power line. Such a class of electric channel is capable of transmitting simultaneously with minimal losses all the power generated by several of the largest electric power stations in Siberia. "During the course of the experiments we found it to be economically expedient to construct 1,300-kV electric transmission lines," said senior scientific staff member from the Electrical Apparatus department G. Podporkin, commenting on the program. On instructions from the USSR Ministry of Power Engineering and Electrification we are now faced with a new stage--proving the promise of electric transmission lines of even higher voltage classes. It is precisely such power bridges which are required to transport the tremendous amount of energy from the regions of Siberia and the Urals to the country's central areas with minimal losses. Moreover, the "Basic Directions for the Economic and Social Development of the USSR for 1981-1985 and for the Period to 1990" envisage the commissioning of the first phase of a 1,500-kV direct-current line and a 1,150-kV alternating current line from Ekibastuz to the Urals. For such a superline, fundamentally new switching apparatus, special fittings and equipment are required, concluded the scientist. The best versions of these will have to be elicited during experimentation at the VUZ proving grounds. [Text] [Moscow SOVETSKAYA ROSSIYA in Russian 18 Jul 81 p 2] 9512

MICRO-GES TESTING--Frunze--Commercial testing of this country's first microGES was completed at the Shamsi hydrometeorological station in the mountains of Tyan'-Shan'. It was delivered there in an ordinary pack and was set up in less than an hour in a swift glacial stream. The unit, weighing less than 80 kg, began to provide current sufficient for lighting an area and for operating production and domestic equipment. The microGES was developed by scientists from the Kirghiz scientific research department of power engineering of Minenergo's GlavNIIproyekt. [Text] [Baku VYSHKA in Russian 23 Jul 81 p 1] 9512

KURPSAYSKAYA GES--Kara-Kul'--Installation began today on the conduit for the fourth and last power unit at the Kurpsayskaya GES. Assembly has begun on a number of pieces of equipment of electrical machinery. Builders and collectives from 60 enterprises which deliver equipment are working at an accelerated pace. With the start-up of the Kurpsayskaya GES at full power, the generation of electric power in Kirghiziya will increase by almost one third. [Text] [Baku VYSHKA in Russian 24 Jul 81 p 1] 9512

HIGHEST OUTPUT LEVEL--Makhachkala, 25 Jul 81--The highest figure for single-day generation of electric power was achieved at the Chirkeyskaya GES--more than 18 million kWh of electric power. It is now high-water time on the river Sulak. The power engineers considered the forecasts of the hydrologists and prepared all the structures in advance for operating the station under such conditions. Each second, the Chirkeyskoye Sea takes in 600 m^3 of water. Before the hydraulic system was built, floods similar to the present one caused much trouble for farmers. A reservoir with a capacity of more than 2.5 billion m^3 became a reliable regulator of the capricious river. The accumulated water supply will insure uninterrupted operation of the units for long periods of time. [Text] [Moscow PRAVDA in Russian 26 Jul 81 p 2] 9512

NEW UNIT AT NIZHNEKAMSKAYA GES--The installation of the sixth power unit was begun at the Nizhnekamskaya GES. It is slated for commissioning in June. The Kama is now unusually high, as if to test the strength of the hydrotechnical structures. In one second, 12,000 m^3 of water pass through the GES's dam--four times more than in the summer. The builders, however, do not slacken their pace: the installation of the turbine was begun two weeks ahead of schedule. Following the carpenters and concrete workers who are building a crater under the turbine, the installation workers are putting in the embedded fittings and are preparing a work front for the subcontractors. Specialization and efficient cooperation among the teams on the construction conveyer have accelerated the operations. The use of the equipment has become more efficient. [Text] [Moscow KRASNAYA ZVEZDA in Russian 3 Jun 81 p 1] 9512

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ENERGY CONSERVATION

OPTIMUM DIAGRAM FOR FUEL PREPARATION

Moscow RECHNOY TRANSPORT in Russian No 6, Jun 81 pp 28-30

/Article by Doctors of Technical Sciences V. Selivestrov and B. Vasil'yev of the Leningrad Institute of Water Transport/

/Excerpts/ It is necessary for oil consumers to prepare themselves for the transition to new types of fuel: hydrogen, synthetic and liquified coal fuels, etc. For the immediate future, however, oil will remain the basic fuel for our river fleet. Therefore, taking into consideration our limited reserves of oil, the shortage and high cost of diesel fuel, we must observe a fuel economy regimen and, in the shortest time possible, facilitate the transition of ship diesel engines to motor and other heavy types of fuel.

An analysis of fuel resources shows that, whereas in 1979 the availability of diesel fuel in the USSR exceeded its use, in the future--by about 1990--the national economy's need for distilled fuel will not be met despite a certain increase in production, inasmuch as oil will be utilized to an ever greater degree as raw material for the petrochemical industry.

We intend to implement a number of measures in order to cut back on this impending shortage: expansion of oil diesel fuel distillation facilities; use of hydrogen, gas and alcohol, coal-processing products, and other types of fuel in diesel engines; shifting over all of our intermediate H.P. diesel engines to the use of motor fuel and mazut.

In keeping with our long-range plans, 85 percent of all intermediate H.P. diesel engines to be manufactured in 1985 will use heavy types of fuel.

It is necessary for the RSFSR Ministry of the River Fleet, in conjunction with other governmental departments, to see to the carrying out of complex work programs aimed at resolving problems connected with the use of new types of fuel in ship diesel engines. With increased fuel viscosity, the system for preparing the fuel is more complicated and the operational and thermotechnical characteristics of diesel engines are decreased. In connection with this as well as in consideration of the relatively small horsepower of river fleet vessel main diesel engines, it might be expedient to limit heavy fuels used by the river fleet to those with a viscosity of no higher than 36 centistoke.

It has been noted that utilization of motor fuel by steamship lines of the Volga Basin is being held back by the unsatisfactory delivery of this fuel to diesel motor ships. This is caused by an insufficient number of bunkering facilities and fuel delivery irregularity.

Shifting 6CHNR36/45 diesel engines to motor fuel has yielded a higher labor intensity of about 60 percent (450 man hours per 1,000 hours of operation) in the engines' technical servicing. This increase in labor intensity is caused mainly by the need to clean filters and burners more frequently as well as by an increase in time spent on servicing separators.

Diesel engines of that size using motor fuel cannot operate for a long time under full load. These shortcomings of the 6CHNR36/45 diesels are well known by their designers. Measures for the elimination of these shortcomings are already being taken at the "Dvigatel' Revolyutsii" Plant.

The small amount of operating time of foreign-made diesels under controlled operating conditions does not allow us as yet to evaluate their work.

Of decisive significance in the normal operation of shipboard power units is the system used to prepare motor fuel, a system designed to rid the fuel of water and mechanical impurities and to provide the required viscosity as well.

Ship fuel preparation systems, depending upon the type of equipment installed on heavy fuel cleaning lines, are divided into three types: a settling tank and centrifugal separator; a centrifugal separator without a settling tank; a settling tank and filtration unit.

To the first type belong the systems used aboard diesel motor ships of the "Volga-Don" type (design number 507B), of the "Baltiyskiy" type (design number 613), of the "Bakhtemir" type (design number 326 and of the "Leninskiy Komsomol" type (design number 488A). The principal cleansing means is a centrifugal separator; before entering the separator, the motor fuel is located in the settling tank that serves as the first cleaning stage. As the tests conducted aboard one of the number 326 design diesel motor ships demonstrated, the system was 50 percent effective in clearing mechanical impurities from the motor fuel. As a result of separation, the initial water content (2.2 percent) was lowered to 0.15 percent. In such a manner, the separator facilitates the necessary cleaning of fuel with the minimum expenditure of time spent in its servicing.

To the second type belong the systems used aboard the "Vladimir Il'ich" (design number 301) and "Valerian Kuybyshev" (design number 96-016) passenger diesel motor ships. Preparation of motor fuel aboard those ships proceeds in accordance with the following plan: basic reserve-overflow tank-preheater-separator-preheater-separator-service tank. Installed aboard ships of the "Vladimir Il'ich" type are electric preheaters from the "Zotse" Firm while steam preheaters of the "Laval" Firm have been placed aboard diesel motor ships of the "Valerian Kuybyshev" type. Tests have confirmed that both one and the other are sufficiently effective in operation.

A third type of fuel preparation system is being used aboard icebreakers of the "Kapitan Chechkin" series (design number 1105). Its distinctive feature is a viscosity meter and filtration unit. Its plan for the cleaning of motor fuel is different from the regular system in that, after settling, the fuel is not sent into a centrifugal separator but into a filtration unit which is designed to rid it of water and mechanical impurities.

As shown by tests, the "Boll" Firm unit provides high-quality cleansing from mechanical impurities (up to 10 ųm) but relatively poor water separation (50 percent). However, there is practically no loss of fuel in the filtration unit while there is a 2-3 percent loss in systems using separators.

Diesel motor ships of design numbers 326, 488A, and 613 have been equipped with fuel supply systems of the regular type, systems which are simpler, more reliable and cheaper than individual or combined systems, inasmuch as they consist of less equipment. All of the systems listed facilitate a reliable transition from diesel to motor fuel, are easy to service, and are sufficiently reliable in operation.

Systems of an individual type, developed by the chief designer division of the "Dvigatel' Revolyutsii" Plant, are being used aboard diesel motor ships of the "Volga-Don" and "Valerian Kuybyshev" type. They facilitate long-range management of the transition from one type of fuel to another, the automatic regulation of fuel pressure and temperature, control over basic parameters and the protection of engines from inadmissable deviations from the norm.

However, as tests have demonstrated, pneumatic valve units which serve in the transition from one type of fuel to another are unreliable, complex, and awkward to operate. Because of this, the unit was replaced with a fuel distributor. An operational check of this modernized system aboard the "Volga-Don 187" diesel motor ship demonstrated its increased reliability.

A combined system for the transmission of fuel is being used aboard icebreakers of design number 1105.

On the basis of its research into and tests of various systems of fuel preparation, the Leningrad Institute of Water Transport has recommended two technological plans, from which a selection should be made, depending upon the availability of equipment for the particular technological plan selected.

The Marx 204 automated separator made by the "Laval'" Firm and the MK2 filtration unit made by the "Sofranc" Firm are recommended.

The system operates in such a manner that the motor fuel, which contains up to 3 percent water, is first allowed to settle in a tank before being cleaned in a filtration unit. Diesel fuel undergoes cleaning in a centrifugal separator.

As test results have demonstrated, the filtration unit of the "Sofranc" Firm operates normally with a water content of up to 3 percent in the motor fuel and achieves a decrease in the amount of water down to 0.5 percent and less.

When the motor fuel's water content is more than 3 percent, the fuel is placed first in a settling tank and then into a centrifugal separator installed on the diesel fuel line. The fuel is thus converted and brought into the work cycle with a productivity which is close to normal. Then, the fuel is sent to a filtration unit where it is heated and completely cleared of water and mechanical impurities.

The effectiveness of the use of motor fuel is characterized by specific economic indicators in the ship's working during navigation.

Results of the operation of dry-cargo diesel motor vessels of the "Volga-Don" SZRP and VORP types which use motor and diesel fuels attest to the savings effected through the use of motor fuel. Operational expenditures for diesel motor ships using motor oil were 12 percent lower than for vessels of the same design using diesel fuel. Specific expenditures for fuel and for their operation as a whole (kopecks per 1,000 ton-km), without including amortization, for vessels of the first group were lower than for the second group by 40.8 and 25.8 percent, respectively.

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